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(54) Discharge lamp

(57) A low pressure electrical discharge lamp contains one or more copper halides as source of ultra-violet emission. Preferred lamps contain 0.1 to 0.5 mg per cc cuprous chloride and argon or neon to a pressure of 2 to 12 torr. A fluorescent material may be present as a coating (16) on an outer envelope (15) surrounding the discharge tube (11) or as a coating on the discharge tube itself. In the latter case, an outer envelope may have an infra-red reflecting coating to maintain the preferred discharge tube operating temperature of 200 to 400°C.

FIG. 1

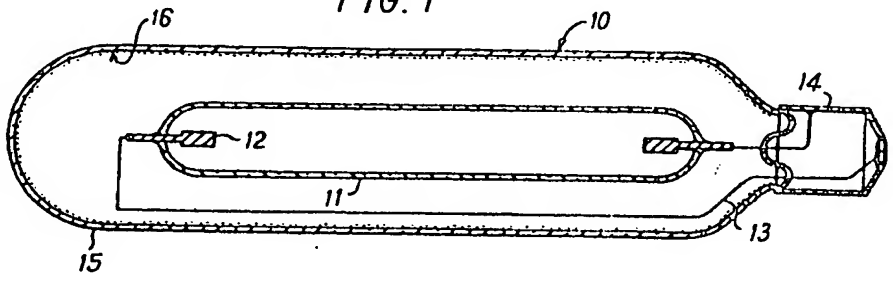

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FIG. 1

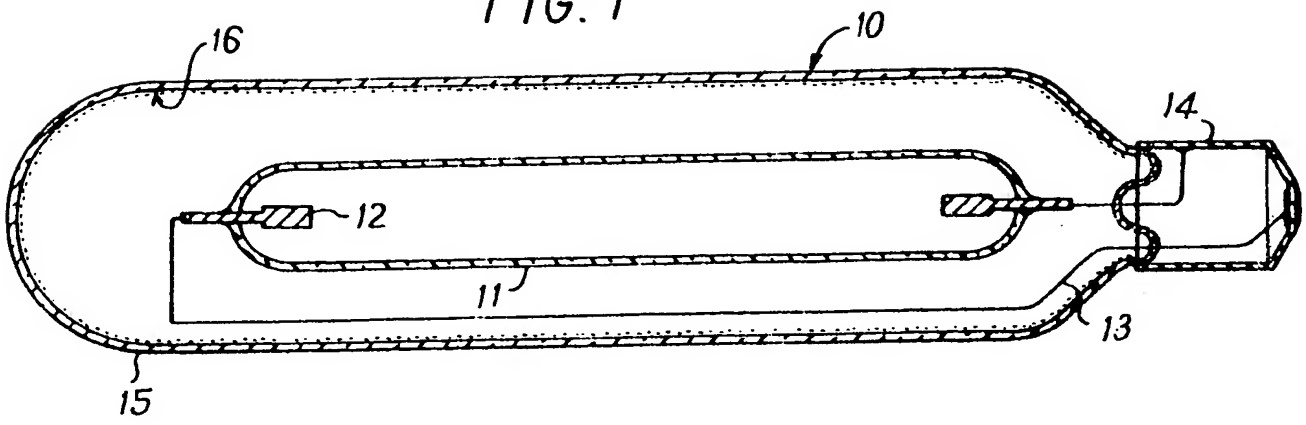


FIG. 2

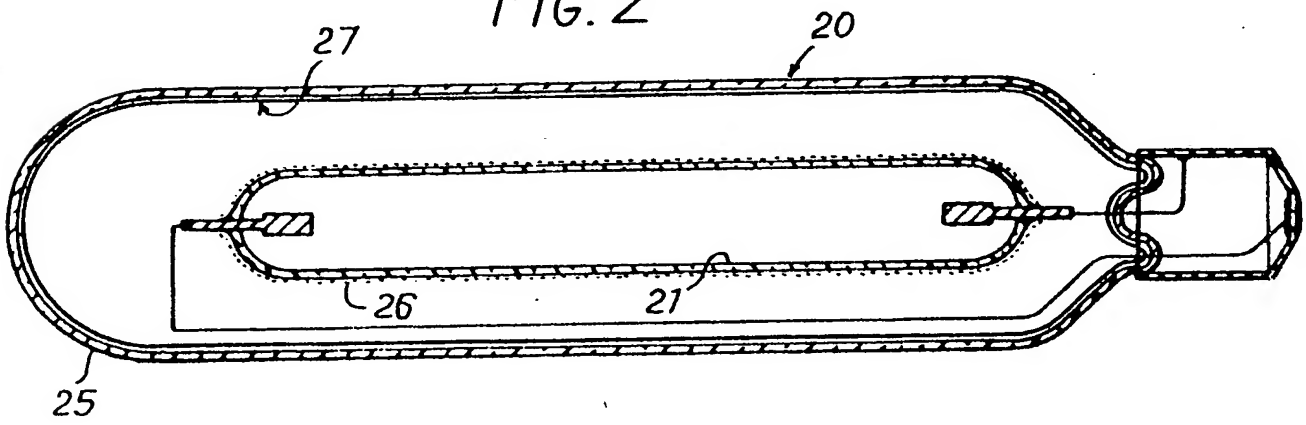
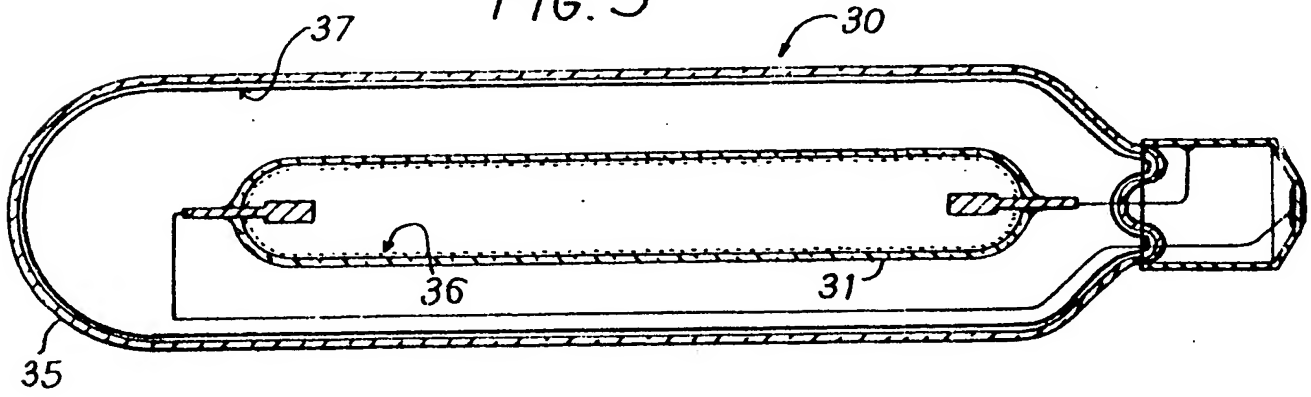


FIG. 3



SPECIFICATION

Discharge lamp

The present invention relates to low pressure electrical discharge lamps and more especially to fluorescent lamps.

Conventional low pressure discharge lamps utilize a mercury vapour discharge and convert to emitted ultra-violet radiation to visible light by means of a coating of phosphor on the discharge tube wall.

This invention now provides an electric discharge lamp which emits strongly in the ultra-violet but which does not contain mercury.

According to the invention a low pressure discharge comprises a discharge envelope provided with electrodes and containing a copper halide or a mixture of copper halides.

The preferred copper halide is cuprous chloride, and the preferred dosage is 0.1 to 0.5 mg per cc. As will be appreciated by those acquainted with the discharge lamp art, the halide should have a high degree of purity and should not be contaminated with water. As with most low pressure discharge lamps, the gas fill will usually also contain a noble gas or a noble gas mixture for starting purposes, for example at a pressure of 2 to 12 torr.

When operating normally, the discharge tube temperature is held at a value in the range 200 to 400°C. When operating under these conditions, the discharge emission has a blue appearance and in addition to lines in the visible spectrum, exhibits resonant lines in the ultra-violet region, notably at 3247.5 and 3274.0 Å.

Although generally useful as a source of ultra-violet radiation, the discharge lamp of this invention is of particular interest as the radiant energy source of a fluorescent lamp, for which purpose a fluorescent powder layer should be located to convert the ultra-violet to visible radiation.

The discharge tube may be made of ultra-violet light transmitting material mounted inside a phosphor coated outer bulb. Alternatively, the discharge tube itself may be phosphor coated and the outer bulb coated with an infra-red reflecting coating.

The preferred material for the arc tube is quartz, which readily transmits ultra-violet, and may be used with an outer tube of glass, which bears a phosphor coating on its inner surface. An alternative material for the tube is a suitable glass e.g. a hard glass, which may be coated internally with phosphor. Such a construction requires less phosphor than an outer bulb used with a tube of similar size to the first.

The electrodes will usually be of a refractory metal, such as tungsten rod, but the starting voltage may be lowered by the use of 3% thoriated tungsten for the electrodes.

Three examples of lamps embodying this invention will now be described with reference to the accompanying drawings, in which:

Figs. 1, 2 and 3 are longitudinal sections of respective first, second and third forms of lamp according to the invention.

The lamp 10 shown in Fig. 1 consists of a discharge tube 11 made of an ultra-violet light transmitting glass, with refractory metal electrodes 12 connected by leads 13 to contacts in an end cap 14. The tube is evacuated and dosed with about 0.3 mg per cc cuprous chloride or other halide or mixture of halides, and filled to about 7 torr pressure with argon or neon. The discharge tube 11 is mounted inside a phosphor coated glass envelope or bulb 15, which is evacuated. The ultra-violet radiation is transmitted through the walls of the discharge tube 11 and excites the phosphor coating 16 on the inner surface of the outer bulb 15 of the lamp, and is converted thereby to visible light radiation. Any phosphor responsive to the ultra-violet emission of the copper halide discharge can be used

In the lamp 20 shown in Fig. 2, the discharge tube 21 is similar in construction to that of Fig. 1 but the phosphor 26 is coated on the outer surface of the discharge tube itself. The outer bulb 25 is similar in construction to the first example but has, instead of the phosphor coating, an infra-red reflecting coating 27 on the inner surface of the glass wall, the coating being a good transmitter of visible light radiation. The infra-red reflecting coating is to help to achieve the temperature (in the range 200 to 400°C) required for the optimum operation of the copper halide discharge as a source of ultra-violet radiation.

For the infra-red reflecting coating, materials already known for use in other types of lamp, e.g. sodium discharge lamps, may be used. Examples of such materials include tin oxide and indium oxide, which may be applied by known methods.

In the third case, shown at 30 in Fig. 3, the discharge tube 31 is again of similar construction to the first case but has the phosphor 36 coated on the inside wall of the discharge tube itself. In this case, the glass used to make the discharge tube 31 need not be a good transmitter of ultra-violet radiation. The outer bulb 35 is identical to that in the second case and has an infra-red reflecting coating 37.

CLAIMS

1. A low pressure electric discharge lamp comprising an arc tube and electrodes and a fill comprising at least one copper halide as ultra-violet emitter.

2. A fluorescent electric discharge lamp having a discharge envelope containing a fill comprising at least one copper halide as ultra-violet emitting material and a fluorescent powder layer located to convert emitted ultra-violet to visible radiation.

3. A fluorescent lamp according to claim 2 wherein the fluorescent coating is formed on a surface of the discharge envelope, which is surrounded by an outer envelope provided with an infra-red reflecting coating.

4. A fluorescent lamp according to claim 2 wherein the discharge envelope transmits ultra-violet radiation and is surrounded by an outer

envelope on which is formed the fluorescent coating.

5. A lamp according to any preceding claim wherein the fill comprises from 0.1 to 0.5 mg per cc copper halide or halides and a noble gas or gases at a pressure of 2 to 12 torr.

6. A lamp according to any preceding claims wherein the copper halide comprises cuprous chloride.

7. A lamp according to any preceding claim designed to operate at a temperature in the discharge envelope in the range of 200 to 400°C.

8. A low-pressure discharge or fluorescent lamp substantially as severally described with reference to either of Figs. 1, 2 or 3 of the accompanying drawings.

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